CLAIMS: I claim:

1. A safety system for a host vehicle whose driver can be protected from audible noise, said safety system comprising:
   (a) one or more directionally discriminating microphones on said host vehicle that discriminate against audible noise made by said host vehicle,
   (b) signal processing means, and
   (c) one or more loudspeakers positioned so that said driver can clearly hear sounds produced by said loudspeakers,

   said signal processing means receiving signals from said microphones, said loudspeakers receiving signals from said signal processing means, and said safety system is configured so that said driver can hear sounds resembling the sounds made by nearby vehicles that are close enough to said host vehicle that said driver should be aware of said nearby vehicles for purposes of safe driving, said driver can approximately locate by ear the position of said nearby vehicles that he or she apparently hears, and said driver is generally unaware of sounds from said safety system that originate from said host vehicle, whereby said driver is made aware of the presence of said nearby vehicles behind or beside said host vehicle, and said driver is not annoyed by additional noise from said host vehicle.

2. A safety system as in claim 1 wherein said loudspeakers are mounted in positions such that they are closer to said driver's ears than to the ears of other occupants of said host vehicle when seated in vehicle seats, whereby passenger in said host vehicle are generally not aware of sounds from said safety system.

3. A safety system as in claim 1 wherein said driver is protected from audible noise by a passenger compartment of said host vehicle, said loudspeakers are two or more in number, and at least one of said loudspeakers is mounted in a position that is closer to the left ear of said driver than to the right ear of said driver, and at least one other of said loudspeakers is mounted closer to the right ear of said driver than it is to the left ear of said driver, and said loudspeakers are positioned close to the driver's ears compared with distances to said passenger compartment windows and roof, and said loudspeakers close to the left ear receive, perhaps indirectly, signals that originated from said directionally discriminating microphones

that are shaped, located and oriented so as to favor sounds originating from the left side of said host vehicle and said loudspeakers close to the right ear receive, perhaps indirectly, signals that originated from said directionally discriminating microphones that are shaped, located and oriented so as to favor sounds originating on the right side of said host vehicle, whereby said driver can easily determine by ear the location of said nearby vehicles.

4. A safety system as in claim 1 wherein said signal processing means includes a dynamic range compressing signal processing means that has as it input, perhaps indirectly, a signal from said microphones, and whose output goes, perhaps indirectly, to said loudspeakers, and whose gain is automatically and progressively reduced as the signal levels increase, whereby mitigating unusually loud sounds.

5. A safety system as in claim 1, further including at least one pavement condition monitoring microphone deployed such that said pavement condition monitoring microphone senses predominately tire noise from said host vehicle, the signals from said pavement condition monitoring microphones being used to change properties of said signal processing means, whereby adjusting said safety system for variable conditions of pavement conditions, weather conditions, and the speed of said host vehicle.

6. A safety system as in claim 1 wherein said signal processing means includes means for automatically setting the sound volume of said safety system to a level sensitive enough to hear conversations outside said host vehicle when said host vehicle is moving slowly, whereby reducing the risk of injuring people while said host vehicle is moving backward.

7. A safety system as in claim 1 wherein said signal processing means includes means for automatically setting the sound volume of said safety system to a level sensitive enough to hear conversations outside said host vehicle when said host vehicle's transmission is in reverse, whereby reducing the risk of injuring people while said host vehicle is moving backward.

8. A safety system as in claim 1, further including means for automatically reducing the sound volume of said host vehicle's radio or entertainment sound system when said host vehicle's transmission is in reverse, whereby reducing the risk of injuring people while said host vehicle is moving backward.

9. A safety system as in claim 1 wherein said signal processing means includes a volume control means that said driver can adjust to change the level of sound that reaches his or her ears from said loudspeakers for a given circumstance of sound producing objects outside and near said host vehicle.

10. A safety system as in claim 1 wherein said host vehicle has a driver's seat in a passenger compartment, further including driver changeable control means that affect the characteristics of said signal processing means, said driver changeable control means being mounted on said driver's seat or a head rest on said driver's seat.

11. A safety system as in claim 1 wherein at least one of said directionally discriminating microphones is a left microphone that is deployed to preferentially sense sounds that originate from the left side of said host vehicle, and at least one of said directionally discriminating microphones is a right microphone that is deployed to preferentially sense sounds that originate from the right side of said host vehicle, and said signal processing means include one filter means that predominately affects signals coming, perhaps indirectly, from said left microphone, and another filter means that predominately affects signals coming, perhaps indirectly, from said right microphone, and these said filter means for the left and right signals affect the signals from said left microphone and said right microphone differently, whereby these deliberately unmatched filters allow people with one ear more capable than the other to determine with one good ear on which side a said nearby vehicle is located.

12. A safety system as in claim 11 wherein the signals from said unmatched filters are combined into a single signal before being converted to sound by said loudspeakers.

13. A safety system as in claim 1 wherein said signal processing means includes one or more level-dependent signal processing means that have frequency response properties that change based on a control signal, said control signal coming, perhaps indirectly, from said directionally discriminating microphones, said control signal responding to signal levels of frequencies in a spectral region for which said directionally discriminating microphones have effective directional properties, said level-dependent signal processing means having as their signal input, perhaps indirectly, signals from said directionally discriminating microphones,

said level-dependent signal processing means having outputs that go, perhaps indirectly, to said loudspeakers, and said frequency response properties change at rates that are substantially below audio frequencies, whereby the sounds provided by said safety system to said driver are realistic representations of sounds made by nearby vehicles.

14. A safety system as in claim 13 wherein said level-dependent signal processing means have essentially no effect on signals that pass through them when sound levels are low compared to signal levels when there is a said nearby vehicle moving at highway speed.

15. A safety system as in claim 1 wherein the directional properties of one or more of said directionally discriminating microphones are achieved by a tapered acoustic waveguide, wherein said waveguide has its larger end opening in the rear of said host vehicle, and with the smaller end of said waveguide inside said host vehicle, and with said smaller end of said waveguide holding any components of said directionally discriminating microphone that are sensitive to water, thereby achieving directionally discriminating microphone properties and sheltering water sensitive components.

16. A safety system as in claim 15 wherein the openings of said large end of said acoustic waveguides are shaped so that the spatial patterns of high selectivity have a desirable, asymmetric shape about the axes of highest sensitivity.

17. A safety system as in claim 15 wherein the directions of high sensitivity of said acoustic waveguides point nearly straight back from said host vehicle and the openings of said acoustic waveguides are substantially asymmetric from left to right so that for sounds originating to the sides of said host vehicle, substantially away from the direction of peak sensitivity, at least one of said microphones is more sensitive to sounds originating from the left of said host vehicle, and at least one of said microphones is more sensitive to sounds originating from the right of said host vehicle.

18. A safety system as in claim 15 wherein said large end openings of said tapered acoustic waveguides are covered by screens, whereby keeping insects and other objects out of said waveguides and reducing noise caused by air moving past said host vehicle.

19. A safety system for a machine whose driver or operator or pilot can be protected from audible noise, said safety system comprising:

(a) sensing means on said machine,

(b) signal processing means, and

(c) sound producing means positioned so that said driver, pilot, or operator can clearly hear sounds produced by said sound producing means,

the elements of said safety system configured so that said driver or operator or pilot can hear sounds representing things or conditions of interest in or near said machine that are sensed by said sensing means, and said driver or operator or pilot can tell by ear when items of interest are in or near his machine, and said driver or operator or pilot can tell by ear the approximate location and importance of said items of interest, whereby said driver, operator, or pilot uses his innate ability to interpret sounds coming from his environment to focus his or her attention on important conditions or objects.

20. A method for making a driver of a host vehicle aware of nearby vehicles that are located behind or beside said host vehicle and close enough to said host vehicle that said driver should be aware of said nearby vehicles for purposes of safe driving, comprising:

(a) sensing sounds from said nearby vehicles while discriminating against sounds that come from said host vehicle,

(b) converting said sensed sounds into signals that represent said sounds,

(c) processing said signals into new, processed signals, and

(d) producing new sounds for said driver from said processed signals,

said new sounds representing to said driver sounds made by said nearby vehicles, and said new sounds having low enough volume, when there are no said nearby vehicles, that said driver is unaware of any of said new sounds that originate from said host vehicle, whereby said driver will stay alert to said nearby vehicles in his driving environment, and said driver will not be annoyed by additional sounds from said host vehicle.